Good Aquaculture Practices Series 4

Prevention and Treatment of Fish Diseases

Aquaculture Fisheries Division

Agriculture, Fisheries and Conservation Department

INTRODUCTION

Fish diseases affect the survival and growth rates of fish under culture. Given that drug treatments are expensive, fish diseases invariably lead to lower harvest and higher cost. Fish farmers often suffer hefty economic losses due to fish diseases.

To alleviate such losses, it is crucial to take precautions to prevent fish diseases and reduce pathogen levels in water bodies. It is also important to prevent water quality from deteriorating and to strengthen the natural resistance of the fish stock.

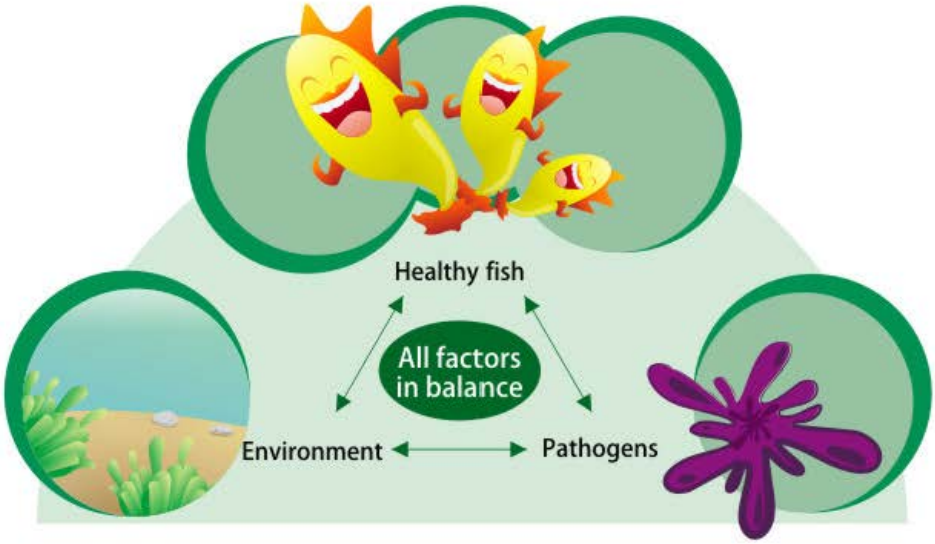
Regular monitoring of fish health is an effective way to identify disease causes and appropriate treatments. One major cause of serious fish kill is overlooking the contagiousness of fish diseases and thus delaying treatment. As such, adequate care and treatment should be given to infected fish promptly.

1 Prevention of fish diseases

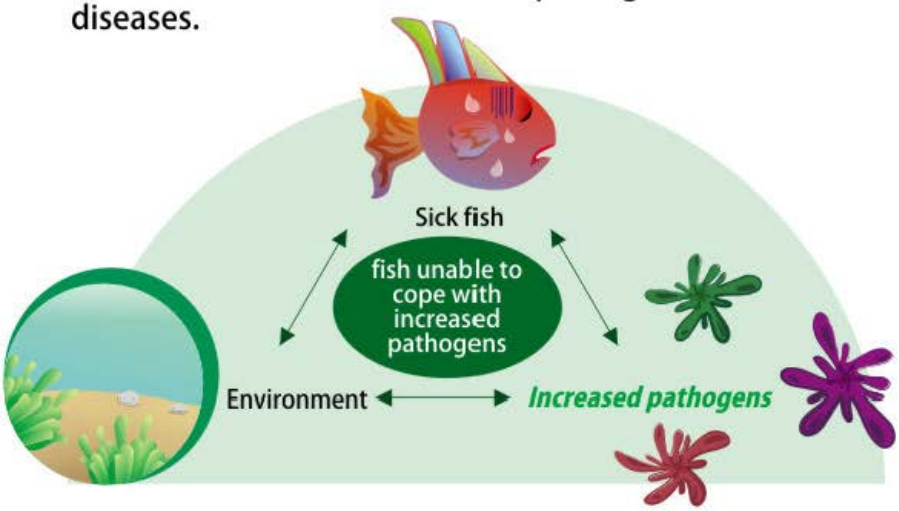
Causes of fish diseases
There are three major causes of fish diseases:

- Presence of environmental pathogens
- Low resistance of the fish stock
- Unsatisfactory water environment

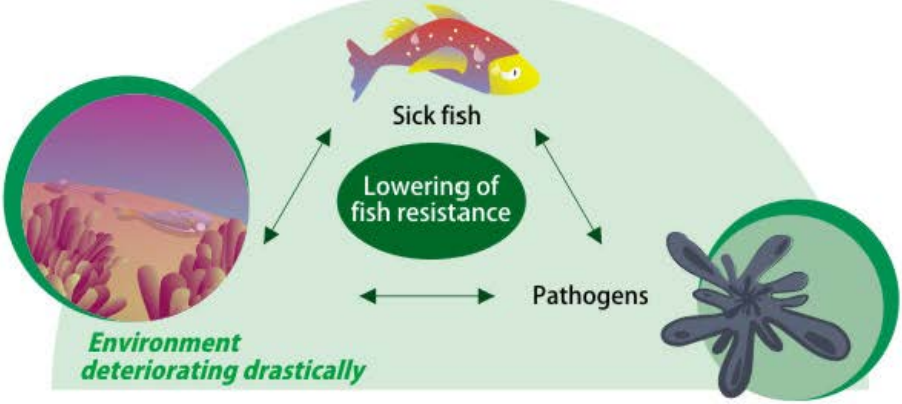
Pathogens (e.g. bacteria, viruses, fungi and parasites) exist in all natural water bodies, yet healthy fish have adequate resistance against them. They can also adapt to reasonable environmental changes and in turn avoid diseases due to pathogenic infection.



When the pathogen level of a water body rises sharply due to external factors, and the natural resistance of the fish stock cannot cope with the increased pathogens, the fish will become vulnerable to pathogenic infection and diseases.



In addition, external factors may also cause drastic changes in water quality, resulting in poor health and low resistance of fish stock. The risks of pathogenic infection and fish diseases or deaths are heightened.



2 Regular disease prevention and control practices

To prevent and control fish diseases, we should:

maintain a good culture environment and prevent the deterioration of water environment; and

use hygienic and nutritious fish feed to boost resistance of the fish stock and to minimise the chance of introducing pathogens to the water body.

2.1 How can we prevent the water environment from deteriorating?

Do not over-feed - Avoid contamination caused by excessive organic matters depositing on the pond bottom/seabed.

Promptly remove fish carcasses in fish ponds/raft net cages. Avoid contamination caused by excessive organic matters depositing on the pond bottom/seabed.

Remove fouling organisms on the raft net cages regularly, clear obstructions so that organic matters can be removed from the fish culture zone by sea currents.

Read the **"Good Aquaculture Practices Series 2 Environmental Management of Mariculture"** and **"Good Aquaculture Practices Series 3 Environmental Management of Pond Fish Culture"** booklets for good practices on culture environment management.

2.2 How to boost resistance of fish under culture?

Maintain a suitable stocking density. A crowded culture environment increases the risk of disease infection and makes the fish nervous. Fish knocking against each other often get surface wounds and may develop diseases as a result.

Use a winnowing basket without knots to reduce the risk of infection caused by surface wounds.

Avoid feeding the stock with trash fish that cannot provide balanced nutrition. This type of feed lessens the natural resistance of fish and makes them more vulnerable to pathogenic infection.

Use dry pellet feed which is hygienic, nutritious and low in bacteria. Dry pellet feed added with vitamins and minerals can further strengthen fish immunity. Read the **"Good Aquaculture Practices Series 1 Fish Feed Management"** booklet for good practices on fish feed management.

2.3 How to reduce pathogens in the water body?

Disinfect fish ponds and culture gear regularly. Refer to the methods listed in Table 1 to keep your fish farm clean.

Store the dry pellet feed properly, keep pellets in a cool, dry and covered place to prevent massive bacterial growth.

Store trash fish properly. Pathogens may proliferate in improperly preserved trash fish. Such feed may introduce large quantities of pathogens to the water. Some pathogens can be eliminated by deep freezing. Never use trash fish that are not clean or fresh.

Table 1: Disinfection of fish farms and culture gear

Item	Method
Fish pond bottom	1 Drain and sun dry the pond for 3 months (or shorten the time by using a sterilising agent).
	2 After draining and sun drying the pond for 3 weeks, sprinkle with quick lime (calcium oxide), (500 g for every square metre). Sun dry for another week before filling with water.
Culture gear, tanks and pipes	1 Disinfect with electric steam gun for about 5 minutes.
	2 Immerse in 1:4,000 formaldehyde (i.e. 100 ml of formaldehyde solution for every 0.4 ton of water) for about 1 hour, then rinse thoroughly with water.
	3 Immerse in 1:2,000 domestic bleach (i.e. 500 ml of bleach for 1 ton of water) for about 3 hours, then neutralise with sodium bicarbonate (soda) and rinse thoroughly with water.

Disinfect fertilised eggs and fry properly - Fertilised eggs and fry may be infected by pathogens that are present in their parents. Treat fertilised eggs with a sterilising agent and treat new fry with freshwater (for marine fish) or potassium permanganate prior to stocking.

Purchase quality fry - Fish farmers should purchase healthy fry with health certificates from reputable suppliers.

Join the fry health inspection programme. Fish farmers can submit fry samples to the Agriculture, Fisheries and Conservation Department (AFCD) for free tests on pathogens and harmful substances before placing purchase orders.

Read the "Good Aquaculture Practices Series 5 Fry Health Management" booklet for good practices on managing the health of fry.

3 Monitoring Fish Disease

While precautions should be taken to prevent diseases, close monitoring of disease is equally important. It is an effective way to detect sick fish and identify the cause of disease at an early stage, so that appropriate treatment can be given and transmittable fish disease can be controlled. For this reason, the AFCD encourages fish farmers to join the Fish Health Inspection Programme and conduct a simple health check on their fish stocks every day.

3.1 AFCD's Fish Health Inspection Programme

AFCD staff visit marine fish culture zones and fish ponds regularly to provide free fish health inspections and to introduce fish disease prevention practices. Services of this programme include:

- Full physical examination

- Tests for bacteria, parasites and viruses

- On-site demonstration of water quality test and fish disease prevention measures
- Introduction of simple fish health inspection routine
- Advice on good fish farm management

Fish farmers are welcome to call the **AFCD's Aquaculture Management Section (Tel. : 2150 7089)** to make inspection bookings or obtain programme details.

3.2 How to inspect the health of your fish stock

Fish farmers should carry out a simple health inspection routine every day. To begin with, observe fish behaviour (stage one). See if the fish are reducing feed intake or showing abnormal swimming patterns. If you are certain that the abnormal behaviour is not connected with environmental factors, carry out a detailed health inspection (stage two). For example, check the body surface, fins and gills, and see if there are any surface parasites. If disease symptoms are detected, seek assistance from the AFCD. Our staff will visit your farm to follow up the fish disease and recommend appropriate treatment.

Stage One : Observe fish behaviour (Table 2)

Feed intake Reduced feed intake is the first sign of many fish diseases. Fish farmers should therefore keep daily feeding records to ensure they have sufficient information to compare general intake trends.

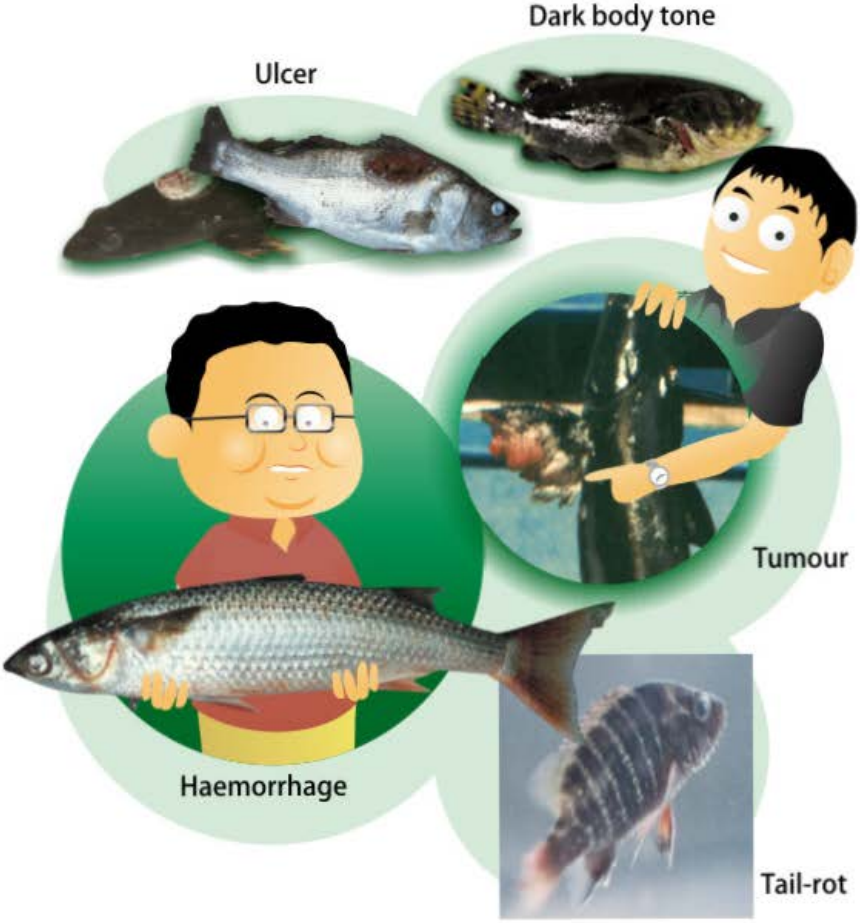
Abnormal swimming patterns Examples are fish lying flat, rubbing against the bottom or net cage edges, jumping out of the water, circling in water or losing buoyancy/balance. All these may be signs of disease.

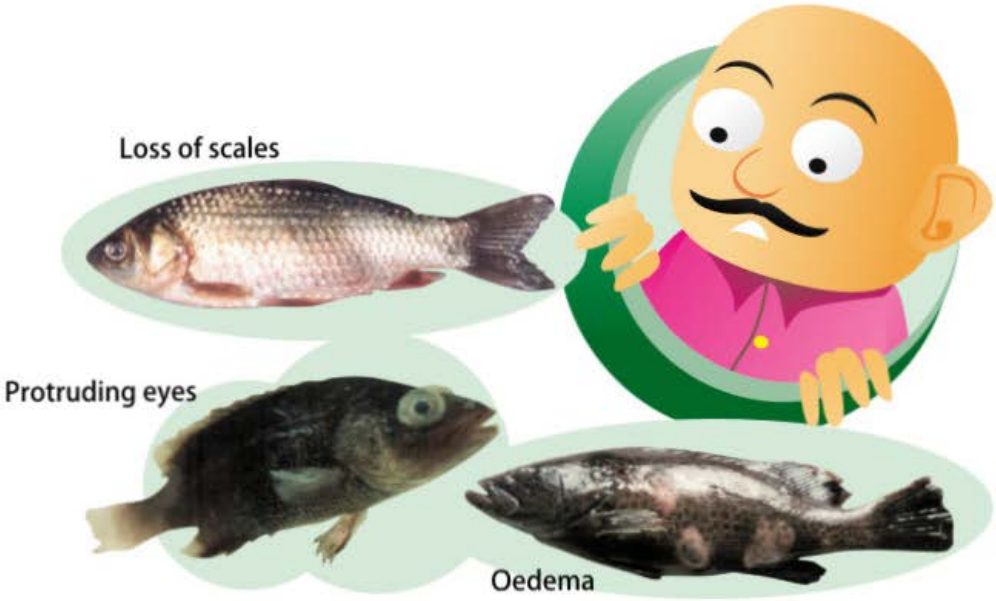
Table 2: Differentiating between sick and healthy fish

	Sick Fish	Healthy Fish
Activity	Swimming slowly; sluggish response	Swimming actively; sharp and responsive
Body Colour	Dull, dark or discoloured	Bright and glossy
Body Surface	White layered patches	Intact
Body Shape	Thin	Normal size
Feed Intake	Poor appetite	Good appetite
Organs	Different fish diseases cause damage to different organs	Internal organs are healthy and normal

Stage Two : Detailed health inspection

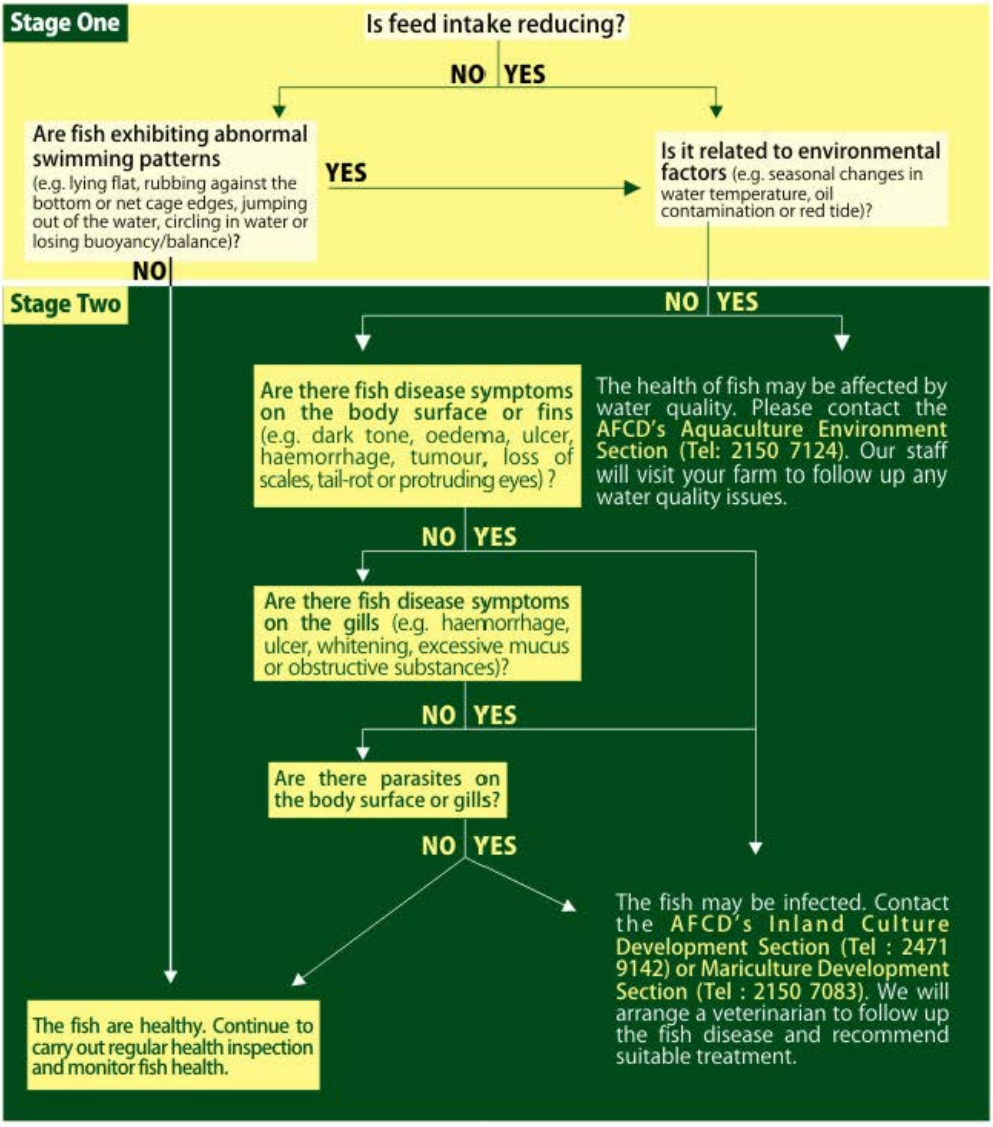
Check the body surface and fins - Body surface and fin wounds are obvious signs of infections. Common body symptoms of fish diseases are:





- Check the gills - If the gills are whitened or show ulcers or with deep red spots, or there are gill flukes, excessive mucus or obstructive substances, the fish may be infected and gill functions may be impaired.

Diagram 1 : Fish disease monitoring flow chart



4 Know More About Fish Diseases

Common fish diseases may be caused by different pathogens, including parasites, fungi, bacteria and viruses. Sometimes diseases are not related to pathogens. Malnutrition, for example, is one reason. Fish diseases common in Hong Kong are listed in Table 3.

Table 3 : Fish diseases common in Hong Kong

Type of Infection	Disease	Affected Culture Environment
Ectoparasitism	Benedeniasis	Marine
	Cryptocaryoniasis / Ichthyophthiriasis	Marine / Freshwater
	Trichodiniasis	Marine / Freshwater
	Chilodonellasis	Marine
	Dactylogyrosis	Marine
	Gyrodactylosis	Marine / Freshwater
	Lernaeosis	Freshwater
	Copepods	Marine / Freshwater
Endoparasitism	Glugea disease	Marine
	Sanguinicolosis	Marine / Freshwater
Fungal infection	Saprolegniasis	Marine / Freshwater
Bacterial infection	Vibriosis	Marine / Freshwater
Viral infection	Viral Infection	Marine / Freshwater
Non pathogen-related diseases	Unbalanced nutrition	Marine / Freshwater

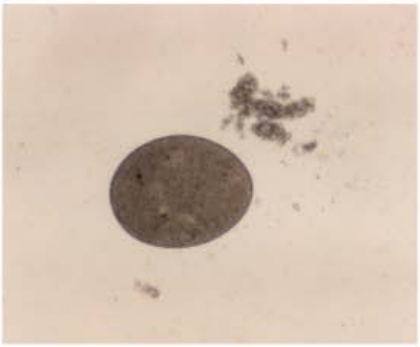
The eggs or spores of most pathogens infect new hosts and transmit fish diseases through the medium of water or by direct contact. When there are environmental abnormalities, water quality deterioration, unbalanced nutrition, bodily injuries or parasitic growth which weaken natural resistance, fish become vulnerable to pathogenic infection and diseases. The following are common fish diseases in Hong Kong and their symptoms and treatments.

4.1 Ectoparasitism

Benedeniasis

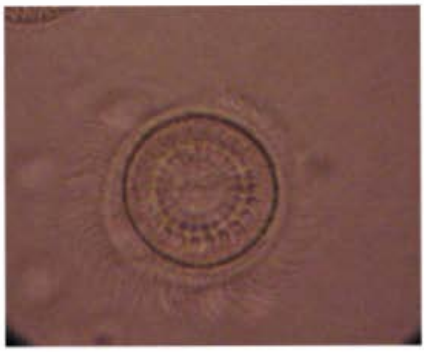
Pathogen	***Benedenia*** - white and transparent, 5-6mm long and 3-4mm wide.
Transmission	***Benedenia*** lay masses of eggs. After hatching, the larvae can survive in seawater for about a day to seek new hosts.
Symptoms	These parasites live in the mouth, eyes, skin and fins of fish and cause bodily wounds and excessive surface mucus. The sick fish get very restless and circle continuously or rub against net surface, resulting in loss of scales and hence infection. The fish gradually lose appetite and eventually die of weakness and exhaustion.
Treatment	Put the sick fish in freshwater and the parasitic ***Benedenia*** will come off in 1 to 2 minutes. Immerse in freshwater for 10 minutes three times every 1-2 weeks, and apply strong aeration.

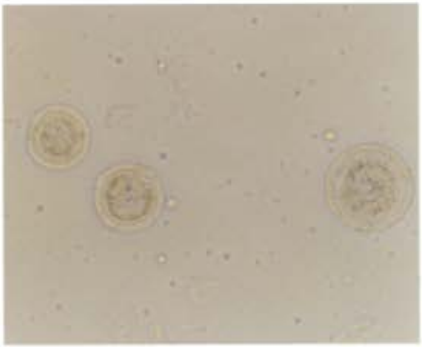
Cryptocaryoniasis (Seawater) / Ichthyophthiriasis (Freshwater)



Pathogen	***Cryptocaryon irritans / Ichthyophthirius multifillis*** - white, ovate or spherical and ciliated, ranging from 40 to 400 microns in length.
Transmission	Juveniles can survive for more than 15 days in water after leaving a fish to seek new hosts. When they find a new host they will burrow into the fish skin and settle there.
Symptoms	White spots will appear on the caudal and pectoral fins and gradually extend to the body surface and gills. Eventually the growing white spots will form a film. The sick fish get irritable and restless. They circle continuously or rub against net surface which results in loss of scales, muscular inflammation and rot. The eyes become white and turbid and the fish gradually lose appetite, get thin and appear sluggish. Eventually gill tissues are badly damaged and the fish will die of suffocation.
Treatment	Immerse in freshwater for 5-15 minutes, or immerse in solution of 1:4,000 formaldehyde* or 1:250,000 potassium permanganate* for one hour. Apply strong aeration. *For correct application of fish drugs, see Table 4

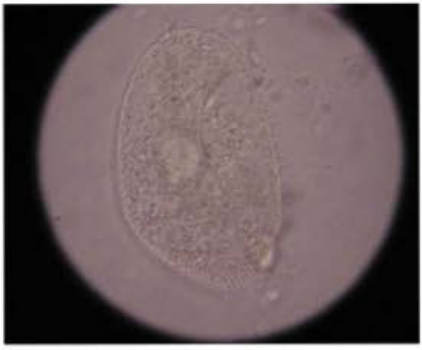
Trichodiniasis





Pathogen	*Trichodina* - about 100 microns in length with peripheral cilia.
Transmission	*Trichodina* lay hundreds or even thousands of spores which can survive in the sediment of fish ponds to wait for suitable environment for hatching. The larvae can survive for 1 to 2 days in the water to seek new hosts.
Symptoms	Symptoms are similar to those of Cryptocaryoniasis. The infected fish show white spots on the body and gills.
Treatment	Similar to that for *Cryptocaryon irritans*.

Chilodonellasis



Pathogen	*Chilodonella* - about 40 microns long and 30 microns wide.
Transmission	*Chilodonella* carry out asexual reproduction by cell division inside fish bodies. After leaving a fish they can survive for 12 to 24 hours to seek new hosts.
Symptoms	Symptoms are similar to those of ichthyophthiriasis. The infected fish have pathological changes in the body and gills.
Treatment	Similar to that for ichthyophthiriasis.

Dactylogyrosis

Pathogen	***Dactylogyrus*** - generally 0.5 mm long with 4 anterior dorsal eye spots
Transmission	***Dactylogyrus*** have full reproduction capacity at birth. They transmit fish disease by direct contact.
Symptoms	***Dactylogyrus*** cause extensive wounds on the fish body surface and increase the chance of fungal and bacterial infection. The sick fish get irritable and restless. They swim frantically to the surface or swim sideways rapidly near the bottom. Body colour darkens and movement becomes sluggish. The fish would eat less, become weak and have difficulty in breathing. Death will eventually o c c u r when the gills and body rot.
Treatment	Use a 1:400,000 potassium permanganate solution* for extended immersion or immerse in solution of 1:4,000 formaldehyde* for one hour and apply strong aeration. When considering to use Trichlorofon for immersion, consult veterinarian advice before treatment. *For correct application of fish drugs see Table 4.

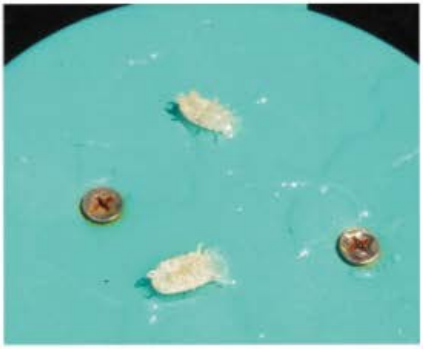
Gyrodactylosis

Pathogen	*Gyrodactylus* - similar to *Dactylogyrus* in appearance but without eye-spots.
Transmission	Same as that of dactylogyrosis.
Symptoms	Same as those of dactylogyrosis but not always causing extensive wounds.
Treatment	Same as that for dactylogyrosis.

Lernaeosis

Pathogen	***Lernaea*** - also known as anchor worms, about 1-2 cm long.
Transmission	The larvae can survive for a long time in water to look for hosts.
Symptoms	Needle worms are parasites found on fish body surface. The sick fish will show decelerated growth due to anorexia, and develop surface wounds as they rub their bodies against objects. This increases the chance of getting other infections. Given their relatively large size needle worms can pierce through and injure internal organs of young fish.
Treatment	Immerse in solution of 1:250,000 potassium permanganate* for 2 to 3 hours and apply strong aeration. When considering to use Trichlorofon for immersion, consult veterinarian advice before treatment. *For correct application of fish drugs see Table 4.

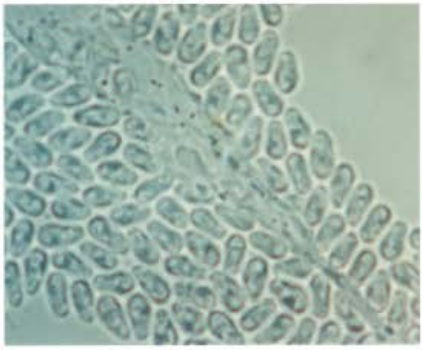
Copepods (commonly known as fish lice)



Pathogen	There are many species of fish lice. They range from several millimetres to several centimetres in length.
Transmission	Same as that of anchor worms.
Symptoms	Fish lice are parasites found on fish body surface. The sick fish will show decelerated growth due to anorexia, and develop surface wounds as they rub their bodies against objects. This increases the chance of getting other infections. Most lice would not cause serious harm to fish but a few species secrete toxins that make internal organs rot.
Treatment	Same as that for lernaeosis.

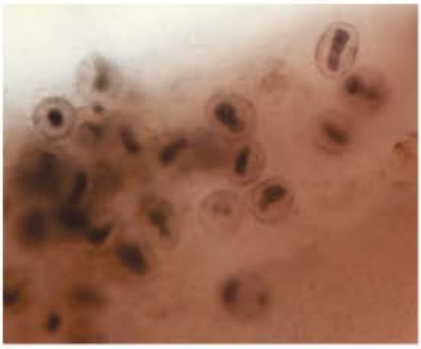
4.2 Endoparasitism

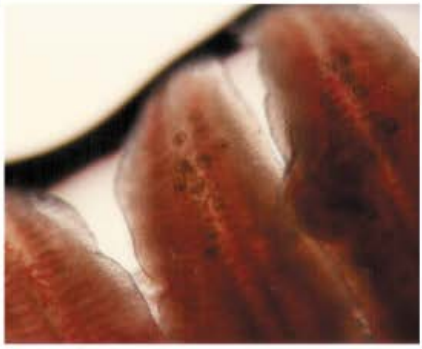
Glugea disease



Pathogen	***Glugea*** - spores are black, granular and 5-10 cm long.
Transmission	***Glugea*** spores reproduce in masses inside the fish. They are then discharged out of the body with urine and faeces or through the body surface to look for new hosts. Dead fish with glugea disease also release large quantities of ***Glugea*** spores when they rot.
Symptoms	Parasitic ***Glugea*** in the large intestinal wall mucosa cause inflammation. The sick fish will lose appetite and gradually waste away.
Treatment	None.

Sanguinicolosis





Pathogen	*Sanguinicola* spp. 10-20 microns long.
Transmission	*Sanguinicola* find their way to the water through fish gills and look for snails as intermediate hosts where they reproduce in masses. When the opportunity arises they invade fish and cause damage to their circulatory system.
Symptoms	Parasitic *Sanguinicola* in the fish circulatory system will cause anaemia. They will also cause damage to gills and kidneys. There are no distinctive initial symptoms but as the disease develops, gills will show dark spots, or there may be anaemic symptoms such as bloated belly and ascites, inflamed anus, upright fins and protruding eyes.
Treatment	Give Praziquantel by oral administration or injection (veterinarian prescription only).

4.3 Fungal infection

Saprolegniasis

Pathogen	*Saprolegnia.*
Transmission	***Saprolegnia*** grow in trash fish, fish feed, culture gear and benthic organic matters. Masses of free spores are released from the body surface, faeces and rotten carcass of infected fish to look for new hosts in the water. Some ***Saprolegnia*** can survive for several years in benthic sediments in the water. As a result, fish may get infected continuously.
Symptoms	***Saprolegnia*** can burrow into the fish body from surface wounds. They can also invade the digestive tract when fish eat food containing them. They bore holes in the intestinal wall and reach internal organs through the circulatory system, reproducing and spreading across the body. Affected fish have greyish white woolly fungi on the body surface. Some ***Saprolegnia*** can cause granuloma - like lesion in internal organs.
Treatment	None. When saprolegniasis is diagnosed, all infected fish must be destroyed and no new fish are to be purchased or introduced until the fish farm is cleared and thoroughly disinfected.

4.4 Bacterial infection

Vibriosis

Pathogen	*Vibrio*.
Transmission	*Vibrio* are present in water. When immunity of fish is poor or there is any surface wound, infection may occur. Fish can also get vibriosis by eating trash fish with *Vibrio*.
Symptoms	Different species of *Vibrio* attack different parts of the fish. Some make the body surface, gills and fins rot, or make the body turn black. Others attack internal organs like the heart, liver, spleen and intestines.
Treatment	Immerse in antibiotics or use them as oral drugs. Either way it must be prescribed by a veterinarian. Please note that some *Vibrio* have developed drug resistance to common antibiotics.

4.5 Viral infection

Viral infection

Pathogens	*Iridovirus* Lymphocystis disease virus *Nodavirus* Spring viraemia virus
Transmission	Viruses are transmitted from trash fish, broodstock or infected fish to other fish. Transmission is very rapid and all the fish in a fish farm can be infected within 12-24 hours. The death rate can be 100%. Fry under one year old are particularly vulnerable. Weather or water quality changes can also lead to infection.
Symptoms	Infection symptoms vary across different viruses. The sick fish may swim abnormally (e.g. circling) or show poor appetite, body wounds or darkened body colour.
Treatment	None. Neither antibiotics nor other fish drugs have any treatment effect. However, as a preventive measure, vitamin C can be added in the feed to boost resistance.

4.6 Non pathogen-related diseases

Unbalanced nutrition

Disease	Fatty liver
Symptoms	Fish fed regularly on high fat feed with no essential fatty acids (such as trash fish) will easily suffer from toxic reaction caused by peroxidation of unsaturated fat. Appetite is poor and growth is slow. It may also lead to bone defect or anaemia.
Treatment	Improve feed quality, store fish feed properly and use suitable additives. For details, read the "Good Aquaculture Practices Series 1 Fish Feed Management" booklet.

5 Treatment for Fish Diseases

One major cause of serious fish kill is overlooking the contagiousness of fish diseases and thus delaying treatment. To maximise the chance of successful treatment, infected fish must be isolated for treatment immediately. If any fish is found infected, isolate it immediately and give appropriate treatment or destroy it.

5.1 Rules for using fish drugs

The Harmful Substances In Food Regulations (Cap 132AF) provide statue against any food containing prohibited substances (e.g. chloramphenicol; see Schedule 2 to Cap 132AF) or containing certain substances in excessive concentration (e.g. Malachite green, Furazolidone and Tetracycline; see Schedule 1 to Cap 132AF).

Fish farmers must not use any fish drugs not prescribed by the AFCD or a registered veterinarian, or any fish drugs with unknown ingredients. When giving drugs, stick to the prescribed dosage and observe the withdrawal period afterwards. In case of doubt, seek assistance from the AFCD.

The following fish drugs are not prohibited but fish farmers must adhere to the following rules :

Drug	Rule
Hydrogen peroxide	Immerse fish in a solution of 1:2,000 30% hydrogen peroxide (i.e. 500 ml of hydrogen peroxide for 1 ton of water) for 1 hour.
Formaldehyde	Immerse fish in a 1:10,000 formaldehyde solution (i.e. 100 ml of formaldehyde for 1 ton of water) for 1 hour. If necessary, increase the concentration to 1:4,000 (i.e. 100 ml of formaldehyde for 0.4 ton of water). Do not use any formaldehyde solution with white sediments.
Potassium permanganate	Immerse fish in 1:250,000 potassium permanganate solution (i.e. 4 g of potassium permanganate for 1 ton of water) for 1-3 hours. For extended immersion, use a 1:400,000 potassium permanganate solution (i.e. 2.5 g potassium permanganate for 1 ton of water) for 24 hours.

5.2 Correct use of fish drugs

Drug bath is a major course of treatment for fish diseases. The correct way of preparing a drug bath is as follows :

- Prepare a correct dose of fish drug, aerating equipment and a water bag seine or large tank.

- Apply drug and stir well. Put a small number of fish into the drug bath first and observe their reaction to the drug. Introduce the major stock only when the reaction of the first batch of fish is normal.

- Observe how the fish react regularly and pump air continuously. If the fish behave strangely, stop immersion immediately and consider other treatments.

Unless otherwise instructed by the AFCD or a registered veterinarian, the fish stock must be kept for at least 30 days after drug immersion before they can be sold or offered for consumption.

5.3 Safety rules for using fish drugs

- When applying fish drugs, avoid contact with eyes, mouth, skin or clothing or inhalation into lungs.
- Wear personal protection gear, such as safety goggles, gloves, protective clothing and mask.
- Some fish drugs are highly volatile. Maintain good ventilation at all times.
- Containers should be correctly labelled and covered. Empty containers may have residues of hazardous drugs.
- Stay well clear of ignition sources and dangerous chemicals like oxides, strong acids and strong alkalis when using fish drugs.
- Should any part of your body come into contact with fish drugs, rinse well with plenty of water immediately.
- In case of contact with eyes, rinse well with plenty of water immediately and lift the upper and lower eye lids to rinse slowly for more than 5 minutes. Seek medical attention right away.
- Store fish drugs in a cool, dry and well ventilated place and away from direct sunlight.

Technical Support

Fish farmers are welcome to telephone the AFCD for free information and technical advice:

General Aquaculture Information : 2471 9142 (pond fish) / 2150 7083 (marine fish)
Fish Health and Disease : 2471 9142 (pond fish) / 2150 7083 (marine fish)
Red Tide and Water Quality : 2150 7124

For further details of prevention and treatment of fish diseases, contact the Aquaculture Fisheries Division of AFCD on 2150 7083 or email us at mailbox@afcd.gov.hk

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